PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P26229WO Ru/dom	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 02/14002	International filing date *(day/month/year)* 10.12.2002	Priority date *(day/month/year)* 17.01.2002

International Patent Classification (IPC) or both national classification and IPC
G06N3/12

Applicant
HONDA RESEARCH INSTITUTE EUROPE GMBH et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of   sheets.

3. This report contains indications relating to the following items:

   I   ☒ Basis of the opinion

   II   ☐ Priority

   III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   IV   ☐ Lack of unity of invention

   V   ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   VI   ☐ Certain documents cited

   VII ☐ Certain defects in the international application

   VIII ☐ Certain observations on the international application

Date of submission of the demand 14.07.2003	Date of completion of this report 07.07.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Oestergaard, M Telephone No. +49 89 2399-2551

Form PCT/IPEA/409 (Cover Sheet) (January 2004)

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

    Description, Pages

    1-16   as originally filed

    Claims, Numbers

    1-10   filed with the demand

    Drawings, Sheets

    1-6   as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this·Authority in the language in which the international application was filed, unless otherwise indicated under this item.

    These elements were available or furnished to this Authority in the following language: , which is:

    ☐   the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

    ☐   the language of publication of the international application (under Rule 48.3(b)).

    ☐   the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

    ☐   contained in the international application in written form.

    ☐   filed together with the international application in computer readable form.

    ☐   furnished subsequently to this Authority in written form.

    ☐   furnished subsequently to this Authority in computer readable form.

    ☐   The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

    ☐   The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

    ☐   the description,   pages:

    ☐   the claims,   Nos.:

    ☐   the drawings,   sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application,

   ☒ claims Nos. 10

   because:

   ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

   ☒ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. 10 are so unclear that no meaningful opinion could be formed *(specify)*:

   see separate sheet

   ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

   ☐ no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the Standard.

   ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-9
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-9
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations

INTERNATIONAL PRELIMINARY
EXAMINATION REPORT.

International application No.   PCT/EP 02/14002

see separate sheet

Section III

1   Claim 10 merely presents a framework of constraints for the application of a general method. No technical implementation of this method is claimed nor is a particular technical effect the result of presenting these constraints to a skilled person. Claim 10 is further not clear. The wording presents an unlimited list of choices by the wording "...different objectives have to be taken into account, e.g. pressure loss and outlet angle calculated by a Navier-Stokes solver and geometric constraints". This type of claim wording could further not possibly have been exhaustively searched due to the fact that only a non-exhaustive exemplary list of objectives is presented. Claim 10 is therefore to be considered a claim for which no examination can be carried out.

Section V:

2   Claim 1 specifies a method in general terms. This type of wording could be interpreted inclusively as a claim to a method for performing a mental act. This is subject matter falling under Rule 67.1(iii) PCT, for which subject matter the IPEA is not required to carry out an international preliminary examination. The following analysis will be based on the assumption that the category of the this claim was intended to be to a method implemented on a state of the art computer. A formal amendment of the application to reflect this fact would have been required.

3   Claim 1 is divided in a preamble and a characterising section having the following features with the features in the preamble denoted P1, P2 etc and features in the characterising section denoted C1 and so on:

P1 - "setting up initial population as parents";

P2 - "reproducing the parents to create a plurality of offspring individuals";

P3 - "evaluating the quality of the offspring individuals by means of a fitness function ...composed of the sum of weighted sub-functions that represent an objective";

P4 - "selecting the offspring(s) having the highest evaluated quality value as parents for the next evolution cycle";

C1 - lines 1-5 of characterising section, which in essence defines an interval within which a weight of a sub-function is allowed to change;

C2 - lines 6-7 of characterising section, which can be rephrased as "dynamic change of respective weights for sub-functions in an optimization".

Of these features the applicant regards features P1, P2, P3, P4 as part of the prior art. The IPEA agrees to this and further adds that this abstract definition of the features amount to no more than stating a desired functionality based on commonly used language. No new or particular technical implementation of any of these features can be recognized from the wording of the claim. It is further not possible to rely on the description in this case to make the wording have a more precise meaning. Of the features in the preamble, feature P4 is the only concrete feature, which, however, is a standard choice for a programmer of computer systems.

Turning now to the characterising section of claim 1, it would seem correct to state that features C1 and C2 are two parts of the same idea. This idea is to define intervals for certain unspecified "sub-functions". These intervals are to be different for different sub-functions. The implementation of the method is then to follow the specification in feature C2, stating the condition that within the specified intervals the weights for the sub-functions are to be changed dynamically. The meaning of "dyanamically" is taken to mean when the method is executed (note mentally or by computer).

In the field of computers it is well known to divide a problem in sub-problems. The different problems may be solved iteratively by programming constructs called loops. A loop will have a start and an end. In some implementations the end of a loop can be defined by the reaching of a condition and in other implementations the end as well as the start can be preset to be a certain number of times set by a variable taking a number of values.

In the prior art it is unquestionable that a number of loops having different numbers of iterations have been used to form the programming solution of a bigger problem. Therefore feature C2 is obvious within the context of computer programming, because in respective iterations variables representing parameters of a physical system are known to take on changing values. Feature C1 is more of a constraint for the implementation of a mathematical model. Faced with this constraint a computer programmer faced with the task of implementing the method of claim 1 would use a tuple (or pair of variables) for each sub-function to keep track of the interval ends for each sub-function. In each iteration of the

program he or she would let one variable per sub-function take on one of the numbers within the allowed intervals. Claim 1 does not reveal any particular way to arrive at a solution to the problem defined by its constraints. Therefore claim 1 is found not to involve an inventive step when compared to universally known basis solutions to programming problems. Article 33(3) PCT is not complied with.

In the prior art random-number generators are further known. In order to let the variables of respective iterations of the implementation take on random characteristics such random-number generators would obviously be used. A record and an evaluation function would then be used to keep a record of which of the solutions defined by a particular iteration was the most desirable one. Therefore in its abstract definition, claim 1, would further not involve an inventive step over a claim including general implementation constructs such as records, random-number generators or lists for keeping track of data.

Claim 1 is further not clear. In a computer-implemented method it is an absolute requirement to define termination conditions in order to avoid what is called infinite loops. The constraints set out in claim 1 do not provide a guidance to a programmer when to terminate the method of dynamically assigning alternative weights of the sub-functions. When implemented on a computer the specification of claim 1 would have to be modified to state the termination conditions of the method.

4   Claim 2 introduces further lack of clarity over claim 1. It is not specified in the claim any particular non-obvious way to implement the generally claimed conversion step.

4.1   Claim 3 is not inventive over the prior art. To take on all the allowable values would lead claim 1 to have a termination condition, thereby overcoming the lack of technical effect inherent in claim 1. Such constraint would, however, probably be the most obvious of all choices available to a skilled computer programmer. The wording "instead of assigning one specific value to each parameter" does not appear to make sense when dependent on claims 1 and 2, because no "assigning one specific parameter" was previously specified in the parent claims.

4.2   As dealt with above in section 2, the solution proposed by claim 4 would be obvious for a computer programmer faced with the constraints as in claim 1.

4.3 Claim 5 would also represent an obvious solution to the problem specified by the constraints of claim 1.

4.4 Periodic functions are well-known mathematical functions. Their use in random-number generation is also readily known and thus this constraint does not present a non-obvious solution to a technical problem.

4.5 Claim 7 is not clear. The effect of applying this constraint is not evident from either description or claims. At present therefore no inventive step can be conceded by applying this limiting condition. In any case, this constraint is no more than a limiting selection of the universe of parameter combinations already presented by the general algorithm of claim 3.

4.6 Claim 8 appears to be a trivial selection when compared to claim 6. The sine function is one of the most common periodic functions.

4.7 Claim 9 has implicitly been dealt with in the preceding sections of this IPER. To state otherwise, would mean that claims 1 to 8 were methods for performing for example mental acts.

5 As a further remark reference is made to document D1 = YAOCHU MIN ET AL: "Adapting weighted aggregation for multiobjective evolution stragegies", EVOLUTIONARY MULTI-CRITERION OPTIMIZATION. FIRST INTERNATIONAL CONFERENCE, EMO 2001, ZURICH SWITZERLAND, 7-9 MARCH, pages 96-110, XP001148377, 2001, Berlin, Germany, Springer-Verlag, ISBN: 3-540-41745-1.

Already from the abstract of this document it is apparent that the general methods stated in claims 1 and 3 for example are not novel over this prior art. From page 97, from line 5 it can be read "This paper investigates two methods using the aggregation-based approach. To approximate the Pareto front instead of a certain Pareto solution, the weight for each objective should be changed systematically. One method is to distribute the weights uniformly among the individuals in the population. The other method is to periodically change the weights with the process of the evolution". From this wording it would seem that the problem area underlying the current application was established in the prior art and that the known solutions anticipated the subject matter of the current application within all its current embodiments. Compared to this prior art, claims 1-9 are therefore not

even seen to be novel contrary to the requirements of Article 33(2) PCT.